



AERONAUTICS
research mission directorate

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Associate Administrator



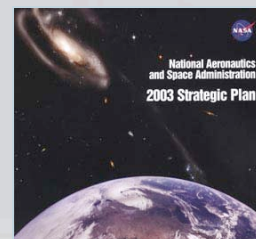
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Council of Deans
April 13, 2005



Aeronautics Research provides breakthrough technologies

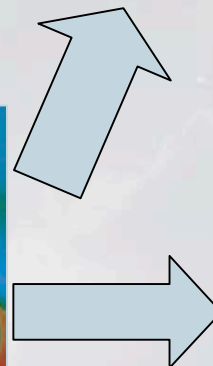


Government Agency Partners

NASA's other Missions



Universities



Industry





National Guidance

President's Commission on the Future of the U.S. Aerospace Industry (Nov 2002)

- “recommends that the United States boldly pioneer new frontiers in aerospace technology....”
- “recommends transformation of the U.S. air transportation systems as a national priority.”

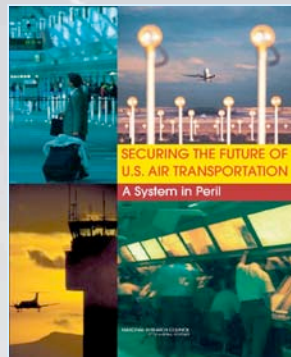


NASA Aeronautics Research



National Research Council (NRC) report “Securing the Future of U.S. Air Transportation: A System in Peril” (Nov 2003)

“[Develop a] vision...related to safety and security, capacity of the air transportation system, environmental compatibility (noise and emissions), the satisfaction of customer needs, and industrial competitiveness.”



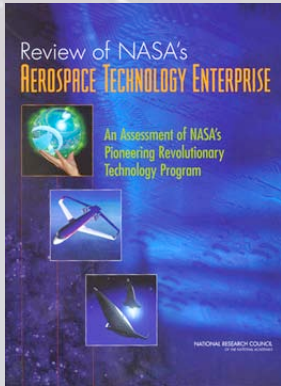
Next Generation Air Transportation System (Dec 2004)

- Establishes national goals and sets direction for transformation
- Creates governance model for multi-agency cooperation



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- **NRC Review of NASA Aeronautics (2004)**
 - “NASA should provide world leadership in aeronautics research and development.”
 - “NASA should reduce the number of tasks in its aeronautics technology portfolio.”
 - “NASA should pursue more high-risk, high-payoff technologies”
 - “NASA’s aeronautics technology infrastructure exceeds its current needs....”

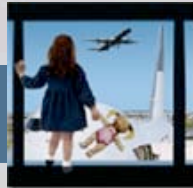
- **Excerpts from OMB public release - “Major Saving and Reforms in the President’s FY 2006 Budget”**
 - “reduces funding for program activities in which the government role is no longer justified”
 - “emphasizes higher risk NASA research programs where the private sector will not invest the necessary funds due to the risk of inadequate financial returns”
 - “reduce the number of civil servants, contractors, and facilities affiliated with the program”
 - “emphasize more extensive use of peer review”



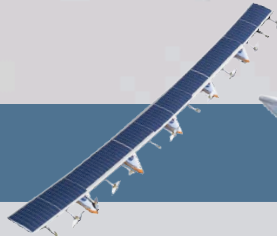
Programmatic Priorities



Ensure NASA contribution to Joint Planning & Development Office (JPDO)



Emphasize public good research



Enhance uninhabited aerial vehicles (UAV) research



Assess possibilities for supersonics



Increase planetary aircraft research



Determine if there is a requirement to continue hypersonics research

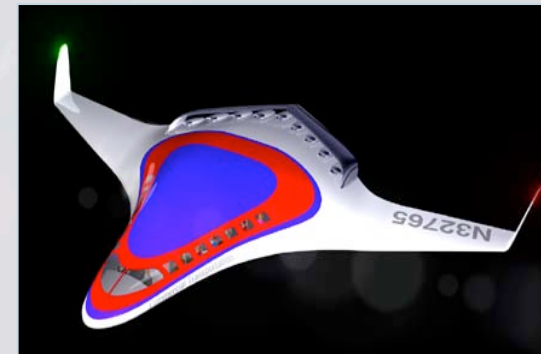
Programs



Aviation Safety & Security



Airspace Systems



Vehicle Systems

<u>FY 2005</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>
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FY 2005 President's Budget	\$M	919.2	956.7	937.8	925.8	941.9
Vehicle Systems		576.8	606.4	576.2	575.3	582.9
Airspace Systems		154.4	175.2	183.7	176.7	179.8
Aviation Safety & Security		188.0	175.1	178.0	173.7	179.2

Proposed FY 2006 President's Budget	\$M	906.2*	852.3	727.6	730.7	727.5	717.6
Vehicle Systems		568.6*	459.1	373.6	385.5	373.5	365.6
Airspace Systems		152.2*	200.3	180.5	174.6	177.9	175.7
Aviation Safety & Security		185.4*	192.9	173.5	170.5	176.2	176.3

* *The FY2005 budgets reflect the NASA Initial Operating Plan, December 2004*





Major Transformation Underway

Agency Transformation

- **President's Vision for Space Exploration**
- **President's Management Agenda - Competitive Sourcing**
- **Aldridge Commission Report Response**
- **Core Competencies Assessment**

Aeronautics Transformation

- **Since Mid 1990's, Increased Investment in Public Good Technologies (air traffic management, safety, security, and environment)**
- **From Technology R&T to Barrier Breaking Demonstrations**
- **Increase Use of Competition Through Merit-Based Research Selection**



Goal:

Decrease the aircraft fatal accident rate and the vulnerability of the air transportation system to threats and mitigate the consequences of accidents and hostile acts

Approach:

- Develop and demonstrate technologies that reduce aircraft accident rates and reduce aviation injuries and fatalities when accidents do occur
- Develop technologies that reduce the vulnerability of the National Airspace System to terrorist attacks while dramatically improving efficiency of security
- Transfer these advanced concepts, technologies and procedures through a partnership with the Federal Aviation Administration (FAA) and the Transportation Security Administration (TSA) in cooperation with the U.S. aeronautics industry

Benefit:

- Breakthrough technologies and knowledge products will reduce safety and security risks and loss of life in commercial and general aviation
 - By eliminating and/or mitigating risks due to unintended causes (for improved safety)
 - By identifying and mitigating risks due to intentional causes (for improved security)
- NASA-appropriate R&D enhances the effectiveness of Other Government Agencies in achieving their mission requirements



Goal:

Enable major increases in the capacity and mobility of the air transportation system through development of revolutionary concepts for operations and vehicle systems

Approach:

- Improve throughput, predictability, flexibility, collaboration, efficiency, and access of the NAS
 - Enable general aviation and runway-independent aircraft operations
- Maintain system safety, security and environmental protection
- Enable modeling and simulation of air transportation operations

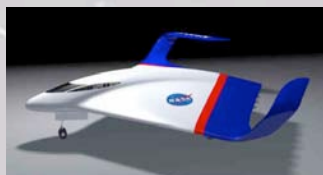
Benefits:

- Enable more people and goods to travel faster and farther with fewer delays
- In alliance with the FAA, increase air traffic management effectiveness, flexibility and efficiency, while maintaining safety
- Enable use of small aircraft at under-utilized, rural/suburban airports to offload congestion at large, urban airports
- Develop capability to perform trade-off assessments of future air transportation systems concepts and technologies





Technology Demonstration Projects in Vehicle Systems Program



**ZERO EMISSIONS
AIRCRAFT** — Start by
demonstrating an aircraft
powered by hydrogen fuels
cells.

The use of fuel cell technology to create an all-electric, zero-emission aviation propulsion system is a paradigm-shifting approach consistent with NASA's mission. The committee ... urges NASA to pursue future work in this area, which leads to the long-range goal of a zero-emissions propulsion system.

Review of NASA's Aerospace Technology Enterprise, NRC ASEP



**SUBSONIC NOISE
REDUCTION** — Start by
demonstrating a 50% noise
reduction compared to 1997
state of the art.

NASA and other agencies should sustain the most attractive noise reduction research to a technology readiness level high enough to reduce the technical risk and make it worthwhile for industry to complete development and deploy new technologies in commercial products, even if this occurs at the expense of stopping other research at lower technology readiness levels.

Review of NASA's Aerospace Technology Enterprise, NRC ASEP



**HIGH ALTITUDE LONG
ENDURANCE REMOTELY
OPERATED AIRCRAFT** —
Start by demonstrating a 14-
day duration high-altitude,
remotely operated aircraft.

The committee fully expects that the Helios (HALE ROA) vehicle will yield significant results for the earth sciences portion of NASA, its primary customer. The committee further applauds NASA for innovative thinking in identifying other possible uses and other possible markets for the aircraft, such as serving as a low-cost, high-altitude (relatively) stationary telecommunications.

Review of NASA's Aerospace Technology Enterprise, NRC ASEP



**SONIC BOOM
REDUCTION** — Start by
demonstrating
technology that could
enable an acceptable
sonic boom level.

NASA should focus new initiatives in supersonic technology development ... airframe configurations to reduce sonic boom intensity, especially with regard to the formation of shaped waves and the human response to shaped waves (to allow developing an acceptable regulatory standard).

Commercial Supersonic Technology: The Way Ahead, NRC ASEP



Desiderata

- Need to ensure ability to define next demonstrations in our portfolio
- Need to provide basis for “seed corn” research
- Need to corporatize management of aeronautics facilities

Program Attributes

- Approximately 20% of available ARMD funds will be used to instantiate a foundational research activity
- A percentage of this program will be devoted exclusively to merit-selected university research in aeronautics to support long-term aeronautical goals
- Approximately \$25M will be used as the basis for an aeronautical test project

**NASA Ames Research Center
(ARC)
Mountain View, CA**

- Current Replacement Value: \$2.0B
- Staffing: 1375 Civil Servants
- Core Competencies
 - Astrobiology
 - Air Transportation System
 - Entry/Descent/Landing Systems
 - Intelligent/Adaptive Systems

**NASA Dryden Flight Research Center
(DFRC)
Edwards, CA**

- Current Replacement Value: \$0.3B
- Staffing: 568 Civil Servants
- Core Competencies
 - Atmospheric Flight Research and Test

**NASA Glenn Research Center
(GRC)
Cleveland, OH**

- Current Replacement Value: \$2.6B
- Staffing: 1875 Civil Servants
- Core Competencies
 - In-Space Propulsion (Including Nuclear Systems)
 - Aero-propulsion Systems
 - Power & Energy Conversion Systems

**NASA Langley Research Center
(LaRC)
Hampton, VA**

- Current Replacement Value: \$2.5B
- Staffing: 2109 Civil Servants
- Core Competencies
 - Sensors and Instruments
 - Aerosciences
 - Entry/Descent/Landing Systems
 - Aerospace Materials & Manufact
 - Systems Analysis/Engineering & Safety





Institutional Impacts

Institutional

- The overall Vehicle Systems budget may be reduced up to 40% at GRC (Ohio) and 50% at LaRC (Virginia).
- Work will increasingly be awarded through competitive processes, and will fund less Civil Service positions by the end of FY 06 at the aeronautics research centers, with primary impact at GRC and LaRC.

Test Facilities

- GRC and LaRC will lack funding support for almost all major test facilities in FY 06 (Total Impact: 20 facilities), creating potential issues with DoD and industry. We have adopted, therefore, a corporate management approach to deal with this issue.

Programmatic

- Terminates the Ultra Efficient Engine Technology (UEET) program at GRC by the end of FY 05.
- The Advanced Aircraft Program (AAP) and the Rotorcraft research will be terminated in FY 06.





- Vision for Space Exploration has been incorporated into revised National Space Policy.
- Many, many reports and commissions from the past ten years call for a National Aeronautics Policy
- Recommend uniting Congressional delegations and initiating informed national dialog with Executive Branch, industry, and academia.





BACK-UP



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- **FY 04 Accomplishments**

- Demonstrated Synthetic Vision Systems that increase a pilot's situational awareness and lower the probability of visibility-related accidents.
- Performed in-service evaluations of a Turbulence Prediction and Warning System designed to give flight crews enough advance warning to avoid turbulence or advise passengers to sit down and buckle up to avoid injury.
- Released icing analysis tools to the aviation community that will lead to safer aircraft and aircraft sub-system designs with respect to operations in icing conditions
- Developed and evaluated a prototype air traffic decision support tool to detect rogue aircraft and provide emergency response data.

- **FY 05 Highlights**

- Demonstrate improvements to flight critical systems that prevent loss of control.
- Demonstrate next generation cockpit weather information systems.
- Evaluate advanced fire and explosion protection systems.
- Demonstrate confidential system for collecting security problems from aviation system users.

- **FY06 Plans**

- Demonstrate a voluntary aviation safety information sharing process to be used by the aviation community for identification and resolution of safety issues.
- Complete the assessment of the Security Program technology portfolio with regard to risks, costs, and benefits and project the impact of the technologies on reducing the vulnerability of the air transportation system.





Airspace Systems

- **FY 04 Accomplishments**
 - Successfully completed the Advanced Air Transportation Technologies (AATT) project which provided a wide variety of decision support tools and technologies to the FAA, airlines, and industry.
 - Demonstrated the feasibility of pilots safely separating themselves from other air traffic while landing at non-radar equipped airports under low visibility conditions
 - Virtual Airspace Modeling & Simulation (VAMS) Air transportation system modeling and analysis tools are being used to assess technologies and procedures for use by the Joint Planning and Development Office
 - Multi-Center Traffic Management Advisor (McTMA) successfully evaluated by FAA in operational environment
- **FY 05 Highlights**
 - Conduct Small Aircraft Transportation System (SATS) integrated technology demonstration in an operational environment
 - Complete analysis of revolutionary operational concepts using VAMS modeling and simulation capabilities
 - Defining a detailed operational concept of wake vortex prediction and avoidance system
 - Conducting and initial concept evaluation for the Eurocontrol/FAA/NASA Future Communications Study supporting the International Civil Aviation Organization's (ICAO) policy development
- **FY06 Plans**
 - Complete development of VAMS simulation and modeling toolbox for the evaluation of advanced operational concepts for the National Airspace System (NAS)
 - Define aircraft climb advisory tool prototype which will provide greater capacity in Procedural Airspace (such as Oceanic Airspace)
 - Complete development of the System-Wide Evaluation and Planning Tool (SWEPT) for use by the FAA System Command Center for strategic planning of flight operations
 - Complete the Eurocontrol/FAA/NASA Future Communications Study

